

## EVALUATION OF DIFFERENT GENOTYPES OF GAILLARDIA FOR GROWTH, FLOWERING AND YIELD PARAMETERS

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### ABSTRACT

A field experiment was conducted at the farm of Horticulture Section, College of Agriculture and Nagpur during rabies as on of 2015-2016 with a view to study the evaluation of different genotypes of gaillardia for growth, flowering and yield parameters. The experiment was laid out in Randomized Block Design with seven different genotypes (Double Mix, NG 01, NG 02, NG 03, NG 04, NG 05 and NG 06) planted in three replications. The results of the experiment revealed that, maximum height of plant was recorded in genotype in NG 05 (85.68 cm), branches plant<sup>1</sup> in NG 03 (4.77), plant spread 68.38 cm in East-West direction and 66.51 cm in North-South direction in NG 02, leaf area (17.81 cm<sup>2</sup>) in NG 06, fresh weight (1816.00 g) and dry weight (613.33 g) in NG 01. As regards flowering parameters viz., days to first flower bud initiation (55.49 days), days to opening of flower (7.13 days), days to 50 per cent flowering (65.19 days) and days to first harvesting of flowers (72.35 days) were recorded early in genotype NG 04. However, significantly maximum flowering span (55.24 days) was recorded in genotype NG 04.

**KEY WORDS:** Gaillardia, Genotypes, Growth, Flowering, Yield

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### INTRODUCTION

Gaillardia, commonly known as Blanket Flower or Fire Wheel, belong to the family Compositae and is a native to Central and Western United States. The plants possess brilliant daisy-like flower with single, double and semi double forms. The large centres of flowers are rose-purple and the densely frilled petals are yellow, orange, crimson or copper scarlet. These attractive, brightly coloured summer flowering annuals or perennials have a remarkably long flowering period. The genus was in honour of Gaillard de Marentoneau, an 18<sup>th</sup> century French botanist. Gaillardias are very popular showy plants, excellent for cutting. Gallardia is excellent for mixed borders, for edging (in the case of dwarfer forms) and for growing in informal groups placed here and there in a semi-rustic setting. Gaillardia is also good for cut flowers, as they last well in water. They are never confined to formal beds. They are conspicuous for profusion and duration of flowering. As the commercial cultivation of gaillardia is gaining importance, introduction and identification of high yielding varieties is necessary. Hence, it is important to study morphological variation and performance of gaillardia genotypes in respect of growth, flowering and yield. Therefore, the present study was undertaken entitled "Evaluation of different genotypes of gaillardia for growth, flowering and yield parameters".

## MATERIALS AND METHODS

An experiment entitled " Evaluation of different genotypes of gaillardia for growth, flowering and yield parameters" was carried out at the farm of Horticulture Section, College of Agriculture, Nagpur during August, 2015 to February, 2016. Experiment was laid out in randomized block design with three replications and seven genotypes *viz.*, Double Mix, NG 01, NG 02, NG 03, NG 04, NG 05 and NG 06.

The experimental land was ploughed once, cross-wise harrowing was done for clod crushing and soil was brought into the fine tilth. At the time of land preparation, well rotten FYM @ 10 tonnes ha<sup>-1</sup> was mixed uniformly in the soil before last harrowing. The field was laid out with flat beds of the dimensions of 3.0m X 3.6 m.

The raised beds of 7 m length and 1 m width and 15 cm height were prepared for raising the seedlings of Gaillardia. The seeds were sown on raised beds on 2<sup>nd</sup> September, 2015 in the line by keeping 8 cm distance within two lines. Immediately after seed sowing nursery beds were irrigated with the help of water can. Regular watering was given in the morning till the seedlings were ready for transplanting. Seedlings were allowed to grow in the nursery beds up to 30 days and then transplanting was done.

An application of FYM @ 10 tonnes ha<sup>-1</sup> was mixed at the time of last harrowing in the field prior to application of chemical fertilizers.

The recommended dose of fertilizer (100: 50: 50 kg NPK ha<sup>-1</sup>) was applied to all the plots in the form of urea, single super phosphate and muriate of potash. Out of this, full dose of phosphorous and potassium and 1/2dose of nitrogen were applied at the time of transplanting. The remaining dose of nitrogen was applied in two split doses, first dose was given at 30 days and second dose was given at 45 days after transplanting.

Observations were recorded on growth parameters *viz.*, height of plant, number of branches plant<sup>-1</sup>, plant spread, leaf area, fresh weight, dry weight and flowering parameters *viz.*, days to first flower bud initiation, days to opening of flower, days to 50 per cent flowering, days to first harvesting, flowering span and yield hectare<sup>-1</sup> and collected data were statistically analyzed as per method suggested by Panse and Sukhatme (1978).

## RESULTS AND DISCUSSIONS

### Growth Parameters

Data from table 1 revealed that, at the stage of 75 days after transplanting, the significantly maximum plant height was recorded in genotype NG 05 (85.68 cm) which was followed by Double Mix (79.87 cm) and NG 04 (75.75 cm) and minimum plant height was recorded in genotype NG 02 (64.28 cm) which was at par with NG 03.

At 75 days after transplanting, significantly maximum number of branches plant<sup>-1</sup> was recorded in genotype NG-03 (23.45) which was at par with genotype NG-06 (22.62).

Significantly moderate branches plant<sup>-1</sup>were records in genotypes

Genotypes NG 05 and NG 06 were at par with each other. Genotypes NG 04 and NG 05 were at par with each other. Genotypes NG 01 and NG 04 were at par with each other. Genotypes Double Mix and NG 01 were at par with each other. Whereas, significantly minimum number of branches plant<sup>-1</sup> was recorded in NG 02 (16.92).

The plant spread at North-South direction was significantly maximum in NG-02 (66.51 cm) over the rest of the

genotypes. Genotypes NG 01 and NG 06 were at par with each other. Genotypes Double Mix and NG 05 were at par with each other. Genotypes NG 03, NG 04 and NG 06 were at par with each other. Whereas, minimum plant spread was recorded in NG-05 (50.98 cm). The plant spread at East-West direction was significantly maximum in NG-02 (68.38 cm) over the rest of the genotypes. Genotypes NG 01 and NG 02 were at par with each other. Genotypes NG 01 and NG 06 were at par with each other. Genotypes Double Mix, NG 03 and NG 04 were at par with each other. Genotypes NG 04 and NG 05 were at par with each other. Genotypes NG 03 and NG 06 were at par with each other. However, minimum plant spread was recorded in NG-05 (51.68 cm).

The genotype NG-06 (17.81cm) had significantly maximum leaf area at 50 percent flowering as compared to other genotypes. Genotypes NG 01, NG 03 and NG 06 were at par with each other. Genotypes NG 04 and NG 05 were at par with each other. Genotypes Double Mix and NG 06 were at par with each other. However, minimum leaf area at 50 percent flowering stage was recorded in the genotype NG-02 (8.43 cm).

The genotype NG-01 (1816 g) had significantly maximum fresh weight at 50 percent flowering which was followed by NG 02 (1657.33 g) and NG 03 (1420.00 g). Genotypes Double Mix and NG 04 were at par with each other. However, significantly minimum fresh weight at 50 percent flowering stage was recorded in the genotype NG-06 (668.00 g).

The genotype NG 01 (613.33 g) had significantly maximum dry weight at 50 percent flowering as compared to other genotypes. Genotypes NG 01 and NG 02 were at par with each other. Genotypes Double Mix and NG 06 were at par with each other. Genotypes NG 02 and NG 03 were at par with each other. Genotypes Double Mix and NG 04 were at par with each other. Genotypes NG 04 and NG 05 were at par with each other. However, significantly minimum dry weight at 50 percent flowering stage was recorded in genotype NG-06(224.67 g).

These results might due to the differences among the genotypes for height of plant and number of branches plant<sup>1</sup> might be due to the differential genetic makeup and varied growth rate among the genotypes of gaillardia. The variation in plant spread and leaf area at 50 per cent flowering stage of gaillardia genotypes might be attributed due to the genetic differences of the genotypes used as the most of the characters are governed by the genetic makeup of the plant. The fresh weight and dry weight was mainly attributed by increased growth characters such as plant height, plant spread and production of more number of branches plant<sup>1</sup>. Similar results were recorded by Bharathi and Jawaharlal (2014). They revealed that, highest plant height was recorded in cv. Dharmapuri Local in marigold. Narsude *et al.* (2010) reported that, maximum plant height and plant spread was recorded in cv. Pakharsangavi Local. However, maximum number of branches plant<sup>1</sup> was recorded in genotype Tuljapur Local-1 in marigold. Raghuvanshi and Sharma (2011) reported that, maximum plant height recorded in cv. Safari Queen. However, maximum plant spread was noticed in cv. Harmony Boy in marigold. Wankhede *et al.* (2004) noticed that, maximum plant height was recorded in gerbera cv. Charmander. Whereas, maximum leaf area was recorded in gerbera cv. Savannah under shade net conditions. Arulmani *et al.* (2015) revealed that, maximum plant height (58.38 cm), number of branches plant<sup>-1</sup> (14.17) and dry weight of plant (40.64 g) were recorded in DGC-2. However, maximum plant spread both at E-W (53.29 cm) and N-S (51.35 cm) direction and leaf area (6046.68 cm<sup>2</sup>) was recorded in genotype AGC-I in gaillardia.

#### **Flowering Parameters**

Data from table 1 revealed that, early flower bud initiation was recorded in genotype NG-04 (55.49 days) which

was found to be at par with genotype NG-01 (57.38 days) and NG-03 (58.30 days). Genotypes NG 02, NG 05 and NG 06 were at par with each other. Genotypes NG 02 and NG 03 were at par with each other. Genotypes Double Mix, NG 05 and NG 06 were at par with each other. However, delayed flower bud initiation (65.45 days) was recorded in Double Mix.

The minimum days to opening of flower were observed in genotype NG-04 (7.13 days) which was at par with NG 01 (7.51 days). Genotypes NG 01 and NG 03 were at par with each other. Genotypes NG 02, NG 05 and NG 06 were at par with each other. Genotypes NG 02 and NG 03 were at par with each other. Genotypes Double Mix and NG 06 were at par with each other. However, significantly maximum days to opening of flower were observed in genotype Double Mix (9.43 days).

Significantly minimum days to 50 % flowering were observed in genotype NG-04 (65.19 days) which was at par with NG 01 (66.35 days). Genotypes NG 01 and NG 03 were at par with each other. Genotypes NG 02 and NG 03 were at par with each other. Genotypes NG 05 and NG 06 were at par with each other. Treatments Double Mix and NG 06 were at par with each other. However, significantly maximum days to 50 % flowering were observed in genotype Double Mix (72.35 days).

The genotype NG-04 (72.35 days) took significantly minimum days to first harvesting of flowers which was at par with NG 01 (74.37 days). Genotypes Double Mix and NG 06 were at par with each other. Genotypes NG 01 and NG 03 were at par with each other. Genotypes NG 02 and NG 03 were at par with each other. Genotypes NG 02, NG 05 and NG 06 were at par with each other. However, significantly minimum days to first harvesting of flowers were taken by genotype Double Mix (82.73 days).

The genotype NG-04 (55.24 days) took significantly maximum flowering span as compared to other genotypes. Genotypes Double Mix, NG 02 and NG 03 were at par with each other. Genotypes NG 01, NG 03 and NG 06 which was at par with each other. Genotypes NG 02 and NG 05 were at par with each other. Genotypes Double Mix and NG 05 were at par with each other. However, significantly minimum days for flowering span were taken by genotype NG-01 (44.65 days).

The different period required for first flower bud initiation and days to opening of flower in gaillardia genotypes might be due varied growth rate and their genetic makeup. The days to 50% flowering and days to first harvesting are might be due to earliness in first flower bud initiation and days to opening of flower. The genotype NG-04 (55.24 days) took significantly maximum flowering span. This might be due to their varied growth rate and genetic makeup.

These results are in close agreement with the results of Singh *et al.* (2003). They observed that, maximum flowering duration was recorded in marigold cv. 'Orange Gate'. Rao *et al.* (2005) reported that, maximum duration of flowering was recorded in marigold cv. Orange Double. Arulmani *et al.* (2015) reported that, minimum days taken for first flower appearance and days taken for 50 per cent flowering were observed in gaillardia cv. DGC-2. Bhuyar *et al.* (2004) reported that gerbera cultivar Ruby Red showed best results in terms of bud initiation of flower under fan and pad cooling system of polyhouse conditions.

### **Yield Parameter**

Data from table 1 revealed that, significantly maximum yield of flowers hectare<sup>-1</sup> was recorded in NG-03 (84.48 q) which was followed by NG-02 (68.40 q) and NG 04 (64.87 q). Genotypes NG 01, NG 02, NG 04, NG 05 and NG 06 were at par with each other. The minimum yield of flowers hectare<sup>-1</sup> was produced by genotype Double Mix (43.60 q).

## CONCLUSIONS

The differentiating ability of yield of flowers hectare<sup>-1</sup> in various gaillardia genotypes could be attributed to their individual genetic potential. Similar results were also reported by Atram *et al.* (2015). They noted that, highest number of flowers plot<sup>-1</sup> and yield of flowers hectare<sup>-1</sup> were recorded in rose cv. Alliance.

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## APPENDICES

**Table 1: Growth, Flowering and Yield as Influenced by Gaillardia Genotypes**

Treatments <sup>a</sup>	Plant height (cm) <sup>b</sup> (90-DAT) <sup>c</sup>	Branches Plant <sup>d</sup> (75-DAT) <sup>e</sup>	Plant spread at 50% Flowering (cm) <sup>f</sup>		Leaf area at 50% Flowering (cm <sup>2</sup> ) <sup>g</sup>	Fresh Weight(g) <sup>h</sup>	Dry Weight(g) <sup>i</sup>	Days to First Flower Bud Initiation (days) <sup>j</sup>	Days to Opening of Flower (Days) <sup>k</sup>	Days to 50% Flowering (Days) <sup>l</sup>	Days to First Harvesting (Days) <sup>m</sup>	Flowering Span (Days) <sup>n</sup>	Yield of Flowers ha <sup>-1</sup> (q) <sup>o</sup>
			N-S <sup>p</sup>	E-W <sup>q</sup>									
T <sub>1</sub> -DoubleMix <sup>a</sup>	79.87 <sup>a</sup>	18.48 <sup>a</sup>	53.35 <sup>a</sup>	15.45 <sup>a</sup>	12.10 <sup>a</sup>	853.33 <sup>a</sup>	286.33 <sup>a</sup>	65.45 <sup>a</sup>	9.43 <sup>a</sup>	72.35 <sup>a</sup>	82.73 <sup>a</sup>	48.69 <sup>a</sup>	43.60 <sup>a</sup>
T <sub>1</sub> -NG-01 <sup>a</sup>	70.96 <sup>a</sup>	19.98 <sup>a</sup>	62.48 <sup>a</sup>	28.89 <sup>a</sup>	13.50 <sup>a</sup>	1816.00 <sup>a</sup>	613.33 <sup>a</sup>	57.38 <sup>a</sup>	7.51 <sup>a</sup>	66.35 <sup>a</sup>	74.37 <sup>a</sup>	44.65 <sup>a</sup>	60.38 <sup>a</sup>
T <sub>1</sub> -NG-02 <sup>a</sup>	64.28 <sup>a</sup>	16.92 <sup>a</sup>	66.51 <sup>a</sup>	17.86 <sup>a</sup>	8.43 <sup>a</sup>	1657.33 <sup>a</sup>	555.00 <sup>a</sup>	60.45 <sup>a</sup>	8.50 <sup>a</sup>	68.27 <sup>a</sup>	77.46 <sup>a</sup>	50.17 <sup>a</sup>	68.40 <sup>a</sup>
T <sub>1</sub> -NG-03 <sup>a</sup>	68.24 <sup>a</sup>	23.45 <sup>a</sup>	57.32 <sup>a</sup>	26.15 <sup>a</sup>	14.41 <sup>a</sup>	1420.00 <sup>a</sup>	474.33 <sup>a</sup>	58.30 <sup>a</sup>	8.04 <sup>a</sup>	67.47 <sup>a</sup>	75.53 <sup>a</sup>	47.39 <sup>a</sup>	84.48 <sup>a</sup>
T <sub>1</sub> -NG-04 <sup>a</sup>	75.75 <sup>a</sup>	20.42 <sup>a</sup>	55.62 <sup>a</sup>	26.59 <sup>a</sup>	17.53 <sup>a</sup>	957.33 <sup>a</sup>	322.33 <sup>a</sup>	55.49 <sup>a</sup>	7.13 <sup>a</sup>	65.19 <sup>a</sup>	72.35 <sup>a</sup>	55.24 <sup>a</sup>	64.87 <sup>a</sup>
T <sub>1</sub> -NG-05 <sup>a</sup>	85.68 <sup>a</sup>	21.12 <sup>a</sup>	50.98 <sup>a</sup>	22.85 <sup>a</sup>	17.81 <sup>a</sup>	1148.00 <sup>a</sup>	383.33 <sup>a</sup>	62.53 <sup>a</sup>	8.85 <sup>a</sup>	70.29 <sup>a</sup>	79.66 <sup>a</sup>	51.47 <sup>a</sup>	61.35 <sup>a</sup>
T <sub>1</sub> -NG-06 <sup>a</sup>	72.41 <sup>a</sup>	22.62 <sup>a</sup>	60.45 <sup>a</sup>	23.37 <sup>a</sup>	12.89 <sup>a</sup>	668.00 <sup>a</sup>	224.67 <sup>a</sup>	63.10 <sup>a</sup>	9.15 <sup>a</sup>	71.85 <sup>a</sup>	80.36 <sup>a</sup>	45.51 <sup>a</sup>	57.80 <sup>a</sup>
SE(m) <sup>±</sup>	1.73 <sup>a</sup>	0.58 <sup>a</sup>	1.74 <sup>a</sup>	0.70 <sup>a</sup>	0.62 <sup>a</sup>	51.76 <sup>a</sup>	28.49 <sup>a</sup>	1.19 <sup>a</sup>	0.26 <sup>a</sup>	0.59 <sup>a</sup>	1.02 <sup>a</sup>	1.04 <sup>a</sup>	4.58 <sup>a</sup>
CD at 5% <sup>±</sup>	5.11 <sup>a</sup>	1.72 <sup>a</sup>	5.13 <sup>a</sup>	2.03 <sup>a</sup>	1.83 <sup>a</sup>	152.57 <sup>a</sup>	83.98 <sup>a</sup>	3.52 <sup>a</sup>	0.79 <sup>a</sup>	1.75 <sup>a</sup>	3.01 <sup>a</sup>	3.08 <sup>a</sup>	13.50 <sup>a</sup>

\*DAT- Days After Transplanting

